152. Reflecting the coordination and double marginalization issues that plague efforts to collaborate in order to offer business services to national accounts with numerous locations (*e.g.*, Starbucks), recent efforts by TWC and Comcast to serve such businesses have met with limited success. For example, after several years of conceptual discussions, TWC and Comcast finally began an initiative several months ago to partner to serve national accounts that span the footprints of the two firms by aggregating services.[197] However, the partnership remains nascent, as multiple years of efforts have resulted in only limited success.[198]

(3) The proposed transaction enhances the incentive and ability of the combined firm to bid on and win super-regional business opportunities

153. By combining the companies' footprints, the transaction alleviates both the coordination issues and the double-marginalization problems and makes it more profitable for the combined firm to bid on (and win) contracts from super-regional businesses. In particular, by replacing the lower "out-of-footprint" margins with higher "in-footprint" margins, the transaction will reduce the marginal costs (by eliminating the

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Although many factors—including construction costs—contribute to the price of any particular service, these examples nonetheless illustrate the higher costs that predominate in Type II service arrangements.

197 Kevin O'Toole, Senior Vice President, Product Development, Business Services, Comcast Corporation, March 7, 2014, interview.

198 Kevin O'Toole, Senior Vice President, Product Development, Business Services, Comcast Corporation, March 7, 2014, interview.

double margin) associated with any project that includes locations spanning the Comcast and TWC footprints, thereby making it more profitable for the combined firm to bid on more projects, benefiting consumers and increasing competition. Moreover, the combined firm will have an incentive to pass through some or all of the reduced marginal cost of serving super-regional businesses via lower prices, higher quality offerings, or both, because lowering prices and/or raising quality—and thus capturing more share—is profit-maximizing when marginal costs fall. In addition, as discussed in Section III.C.2, internal governance structures combined with common incentives are likely to be more effective in providing a well-coordinated offering than are contracts between independent firms, thus leading to higher quality and more seamless service.

154. Hence, any business whose locations span the footprints of Comcast and TWC stands to benefit from the transaction. (See Figure 4 for a map of the footprints today.) Post-transaction, the combined firm will have a presence in the majority of the large business centers in the United States. Comcast has identified six regions where merger-related benefits to business customers are likely to be particularly large:[199]

- *Northeast Corridor*: Combining Comcast services in Boston, New Jersey, Philadelphia, Baltimore, and Washington, DC with TWC services in New York City;

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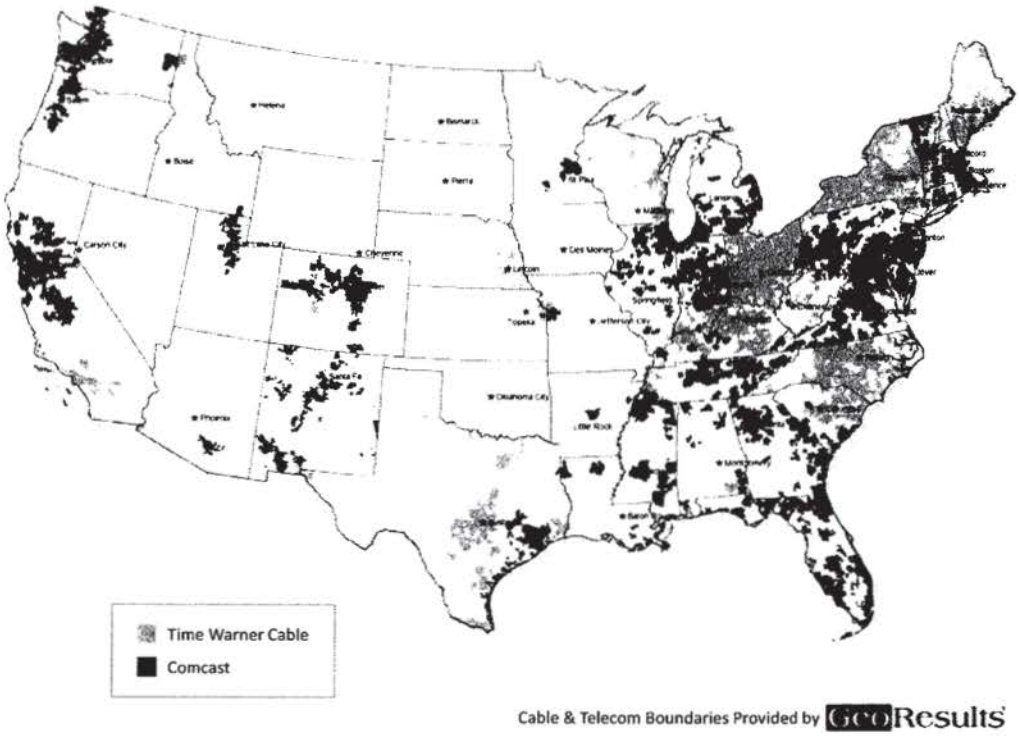
[199] Kevin O'Toole, Senior Vice President, Product Development, Business Services, Comcast Corporation, February 20, 27, and 28, 2014, interviews.

- *Midwest*: Combining Comcast services in Philadelphia, Pittsburgh, Detroit, and Chicago with TWC services in Cleveland and Columbus;
- *Midwest 2*: Combining Comcast services in Chicago, Detroit and Indianapolis with TWC services in Milwaukee, Green Bay, Kansas, Lexington, and Louisville;
- *Texas*: Combining Comcast services in Houston with TWC services in Austin, Dallas, and San Antonio;
- *Southeast*: Combining Comcast services in Charleston, Atlanta, Mobile, Tallahassee, Jacksonville, and Miami with TWC services in Greensboro, Charlotte, Columbia, and Charleston; and
- *Pacific Coast*: Combining Comcast services in San Jose, San Francisco, Sacramento, Portland, and Seattle with TWC services in San Diego and Los Angeles.

Figure 4: Comcast and TWC Footprints



(b) The benefits of combined expertise

155. The sharing of best practices and technologies between the two firms will enable the combined firm to offer a more robust portfolio of broadband offerings across all locations in the combined footprint than could either separate firm. For example, although both companies currently offer speeds of 10 Gbps or more to business customers that use an FTTP solution, the fact that Comcast has invested in making its network all digital more quickly and on a more widespread basis than TWC means that it can offer a superior alternative (including faster speeds) to those business customers that do not need the full FTTP solution.[200] As described in more detail below, Comcast's experience in upgrading its network to all-digital will allow it to offer this superior alternative in the TWC footprint more quickly than TWC could on its own.

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200 As discussed in Section IV.B.3, the transaction will accelerate the deployment of all-digital technology in the TWC footprint.

Based on its all-digital HFC network, Comcast currently offers top speeds of 150 Mbps downstream and 20 Mbps upstream. (*See* http://business.comcast.com/internet/business-internet/plans-pricing, *site visited* April 3, 2014.

In contrast, TWC typically offers top speeds of 50 Mbps downstream and 5 Mbps upstream. (*See* http://www.timewarnercable.com/en/business-home/services/internet.html, *site visited* April 3, 2014. Only where TWC has already upgraded its network to all-digital—in parts of New York City and Los Angeles—does it offer speeds up to 300 Mbps downstream and 20 Mbps upstream. (*See* Time Warner Cable, "Time Warner Cable to Transform TV and Internet Experience in New York City and Los Angeles," January 30, 2014, *available at* http://ir.timewarnercable.com/investor-relations/investor-news/financial-release-details/2014/Time-Warner-Cable-to-Transform-TV-and-Internet-Experience-in-New-York-City-and-Los-Angeles/default.aspx, *site visited* April 3, 2014.

156. The combined firm's business customer offerings will also benefit from TWC's technological capabilities. For example, TWC offers cloud services to mid-market business customers. TWC obtained these capabilities through its acquisition of NaviSite, an acquisition that was itself a reflection of TWC's strategy of focusing on mid-market business customers.[201] In contrast, Comcast's strategy has focused more on small business customers, and consequently, it would take Comcast years (and likely over $100 million) to develop these same capabilities.[202] Post-transaction, these valuable technological capabilities of TWC will be available to business customers throughout the combined footprint, including those in Comcast's current footprint.

(c) Additional benefits of greater scale

157. For the reasons discussed in Section III.A, the increased scale of the combined firm will increase the revenue potentially available from investments, thus enabling the combined firm to undertake projects with large fixed investment costs that would not have been profitable for either separate operator. For example, to meet the expanded business service opportunities created by the transaction, the combined firm will have a greater incentive to make the substantial investment required to serve large business customers, including laying fiber over a larger portion of the combined firm's footprint,

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201 Kevin O'Toole, Senior Vice President, Product Development, Business Services, Comcast Corporation, March 26, 2014, interview.

202 Kevin O'Toole, Senior Vice President, Product Development, Business Services, Comcast Corporation, March 26, 2014, interview.

which will be an integral part of this investment because large businesses need the robust, low latency network connections that fiber provides. I understand that Comcast believes that the transaction will incentivize greater investment in an expanded fiber network, as the greater scale allows the enormous fixed costs to be spread over a larger base of customers.[203]

158. I also note that expanding fiber deeper into wired networks is one of the core objectives of the Commission's National Broadband Plan.[204] As the National Broadband Plan recognized, "pushing fiber deeper into broadband networks considerably improves the performance and reliability of those networks."[205] As I discuss further in Section IV.B.3, such investments in network expansion will benefit residential consumers in addition to business customers.

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203 Declaration of Michael J. Angelakis, ¶¶ 33-39.

204 *See, e.g.*, Brian Fung, "A Report Card on the Nation's 4-Year-Old Broadband Plan – from the Man Who Wrote It," *Washington Post*, March 22, 2014, *available at* http://www.washingtonpost.com/blogs/the-switch/wp/2014/03/22/a-report-card-on-the-nations-4-year-old-broadband-plan-from-the-man-who-wrote-it/, *site visited* March 28, 2014.

205 Federal Communications Commission, "Connecting America: The National Broadband Plan," *available at* http://download.broadband.gov/plan/national-broadband-plan.pdf, *site visited* March 28, 2014 (hereinafter *National Broadband Plan*), 114.

3. Deeper penetration by cable operators into business services traditionally provided primarily by telcos is pro-competitive

159. By expanding the ability and incentive of the combined firm to compete in the business services segment—including competition for enterprise services where Comcast and TWC currently have a negligible presence—the transaction creates important new competition to the benefit of business customers. The benefits of this competition are proven by actual experience: Where cable operators have been able to compete for business services against the incumbent telcos, the result has been dramatically lower prices and/or improved service quality.[206] The following examples illustrate the benefits that have accrued to actual small and mid-sized business customers due to entry by Comcast and TWC.

- After switching to Comcast, several school districts in Pennsylvania, saw their bandwidths increase "exponentially, and in some cases for half the price," which has enabled them to obtain cloud computing services, video conferencing services, and other online educational tools that had been previously too expensive.[207]

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206 Industry observers have noticed the impact of this competition. For example, Rosemary Cochran of VSG notes, "Broader accessibility to on-net fiber has started to shake up the services markets. Fiber-based providers and Cable MSOs are capitalizing on the reach and cost advantages of their footprints juxtaposed to legacy infrastructures. Customers are reaping the benefits of more service options, more competitive pricing, and faster service installations." (Vertical Systems Group, "US. Business Fiber Gap Narrows in 2013," April 3, 2014.)

207 *See* "Back Office Business," *School CIO*, January 31, 2014, *available at* http://www.schoolcio.com/cio-feature-articles/0109/back-office-business/54654, *site visited* March 28, 2014.

- After switching to Comcast Ethernet to connect multiple office locations and distribution centers throughout the Eastern United States, Utz Quality Foods, Inc. realized "a significant savings, while enjoying more bandwidth than what our T1 lines had given us."[208]

- Union Bank in Ohio used T-1 broadband lines provided by five separate telecommunications carriers before switching to TWC. Switching to TWC has provided many benefits. For example, according to a TWC case study:[209]

> [T]he data transmission speed has doubled, having gone from 1.5 Mbps on the old T-1 lines to a blazing fast 3 Mbps bandwidth on TWCBC's state of-the-art fiber-optic network. As a result, the bank's data congestion problems are a thing of the past. . . . TWCBC was able to fulfill the bank's most stringent network security needs through its managed security program, which includes filtering and around-the clock monitoring that Union Bank is required to maintain [. . .] the solution has resulted in a tremendous reduction in the monthly cost of Union Bank's broadband service.

- A Texas town government (the City of Colleyville) "developed its first IT department in 2004 and began linking six data centers supporting seven city buildings running independently . . . . Their old copper T1 network came up short as Colleyville moved to an Internet-based system . . . . Already on the ropes because of the Great Recession, Colleyville also learned that its T1 costs were

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208 *See* "Utz Upgrades Connectivity for Offices, Distribution Centers," *The Evening Sun* (Hanover, PA), April 24, 2013, *available at* http://www.eveningsun.com/news/ci_23096622/utz-upgrades-connectivity-offices-distribution-centers-including-hanover, *site visited* March 28, 2014.

209 Time Warner Cable, Case Study, "The Union Bank Company Cashes in on Blazing Fast Ethernet and Managed Security Services from Time Warner Business Class," November [2013], *available at* http://www.timewarnercable.com/en/business-home/resource-center/case-studies/union-bank-company.html, *site visited* March 25, 2014.

rising drastically."[210] Switching to TWC has provided many benefits to Colleyville. For example, according to a TWC case study:[211]

> The TWCBC secure and fiber-rich EVPL [Ethernet Virtual Private Line] network, scalable up to 10 Gbps+, [which] helps with routine government tasks . . . . It has also enabled . . . Colleyville to centralize servers, applications and terabytes of data storage from six to two data center facilities. The centralization has brought numerous enhancements to city administration, such as hardware and electricity cost savings, data synchronization across all its facilities, centralized sewage and water monitoring systems, enabling online training for firefighters and police officers and desktop virtualization.

160. The telcos have also responded to the entry of TWC, Comcast, and other cable operators into the business services segment by, for example, increasing broadband speeds and adding features to their broadband and related offerings, to the direct benefit of business customers. In particular, I understand that telco speeds have increased from six Mbps a few years ago to 45+ Mbps today and that such speed increases required expensive fiber extensions to shorten the copper loop lengths.[212] I also understand that Comcast believes it was pressure from higher-speed cable data services that caused these

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210 Time Warner Cable, Case Study, "City of Colleyville Modernizes their Network with Time Warner Cable Business Class Fiber-Rich Ethernet Services," November 2013, *available at* http://www.timewarnercable.com/en/business-home/resource-center/case-studies/city-of-colleyville.html, *site visited* March 25, 2014.

211 Time Warner Cable, Case Study, "City of Colleyville Modernizes their Network with Time Warner Cable Business Class Fiber-Rich Ethernet Services," November 2013, *available at* http://www.timewarnercable.com/en/business-home/resource-center/case-studies/city-of-colleyville.html, *site visited* March 25, 2014.

212 Kevin O'Toole, Senior Vice President, Product Development, Business Services, Comcast Corporation, March 26, 2014, interview.

speed increases to occur.[213] In addition, telcos have also added features to their service bundles to counter cable's faster speeds and attempt to win back lost business customers. For example:[214]

- Verizon has added Google Apps and sometimes a second phone line;
- CenturyLink's Core Connect bundle has added website design and hosting to its Internet Office (DSL) and Core Connect (IP voice/data) services, along with domain name registration, fax over email and data backup;
- AT&T's "All For Less" business bundles offer a mix of wireline and wireless, along with mix-and-match data backup, applications and IT support.

B. THE PROPOSED TRANSACTION WILL LEAD TO FASTER, MORE RELIABLE BROADBAND SERVICE, BENEFITING BOTH RESIDENTIAL CUSTOMERS AND EDGE PROVIDERS

161. As described more fully below, and consistent with Comcast's proven track record of high quality broadband service, the proposed transaction will generate faster and more reliable broadband service for the combined firm's customers. Critically—and in direct

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213 Kevin O'Toole, Senior Vice President, Product Development, Business Services, Comcast Corporation March 26, 2014, interview.

214 *See generally*, Verizon Inc., "FiOS Internet," http://www.verizon.com/smallbusiness/products/business-FiOS-Internet/packages/fiosInternetOverview.jsp?smbReferenceValue=SMBFIOSInternetPackageRef, *site visited* April 3, 2014; AT&T, "Internet," https://www.att.com/smallbusiness/productIndex.jsp?prodType=internet&wtLinkName=SMBIDChildFamily-InternetAccess-KnownLocationPg_Internet&wtLinkLoc=SMBIDChildFamily-InternetAccess-KnownLocationPg_Breadcrumbs&WT.svl=3, *site visited* April 3, 2014; Kevin O'Toole, Senior Vice President, Product Development, Business Services, Comcast Corporation, March 26, 2014, interview.

contrast to any claims that the transaction will harm edge providers—these improvements in broadband service help not only residential broadband customers but also edge providers, because the platform on which they interact with consumers will improve.

162. In the remainder of this section, I first explain that improved broadband service will help both residential customers and edge providers, fostering a "virtuous circle" that benefits both sides of the market and stimulates competitive reactions that further benefit both Internet consumers and edge providers. This conclusion follows directly from the complementarities between edge services and high-quality broadband service that the Commission has recently recognized. I then explain the sources of improved broadband service in terms of (i) benefits from sharing the distinct strengths of the two firms today and (ii) the ways in which the transaction will spur new investments.

1. Improved broadband service leads to a "virtuous circle" that benefits not only residential broadband customers but also edge providers

163. The Commission has recognized that, due to complementarities between edge services and the provision of broadband, improvements in either edge services or broadband networks leads to a "virtuous circle" of innovation.[215] The Commission has described it as:[216]

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215 *See also*, Section II.B.1(a).

216 *Open Internet Order*, ¶ 14. *See also, Verizon v. Federal Communications Commission et al.*, No 11-1355, United States Circuit Court of Appeals, January 14, 2014, 4 (noting that

> "...a virtuous circle of innovation in which new uses of the network—including new content, applications, services, and devices—lead to increased end-user demand for broadband, which drives network improvements, which in turn lead to further innovative network uses."

Similarly, Jon Sallet, Acting General Counsel, FCC, recently noted:[217]

> Metcalfe's law tells us that the addition of each single additional user to a network creates more than one unit of additional value to the network as a whole. Not just for new users, but for every user and edge provider, including the businesses in Silicon Valley that create networking apps, software, and hardware.

Put simply, faster broadband speeds lead to an increase in edge services, which leads to more usage of the network, which attracts more edge providers and creates more incentives to improve broadband network speed and quality, and so on.

164. This "virtuous circle" can be understood in the context of the economics literature on two-sided platforms and network effects (or "network externalities").[218] A two-sided market brings together two types of users (*e.g.*, residential broadband customers and edge

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the Commission's "virtuous cycle" analysis "is reasonable and supported by substantial evidence").

217 "Prepared Remarks of Jon Sallet Acting General Counsel, Federal Communications Commission," Conference on Competition and IP Policy in High-Technology Industries, Stanford, CA, January 22, 2014, *available at* http://transition.fcc.gov/Daily_Releases/Daily_Business/2014/db0124/DOC-325267A1.pdf, *site visited* March 28, 2014, 4.

218 *See, e.g.*, Jean-Charles Rochet and Jean Tirole (2006)."Two-Sided Markets: A Progress Report." *The RAND Journal of Economics*, 37: 3; Joseph Farrell and Paul Klemperer (2007), "Coordination and Lock-In: Competition with Switching Costs and Network Effects," in *Handbook of Industrial Organization*, Volume 3, Mark Armstrong and Robert Porter, ed, Amsterdam: Elsevier; Marc Rysman (2009), "The Economics of Two-Sided Markets," *Journal of Economic Perspectives*, 23: 125-143.

providers) through a common platform (*e.g.*, the broadband network). Network effects "are present in markets where the value of a product or service to each customer is affected by the number of other customers who use it."[219] Indirect network effects arise when a group on one side of the platform (*e.g.*, end-users) benefits from more units on the other side of the platform (*e.g.*, edge providers) and vice versa. Indirect network effects can be understood as economies of scale that generate increasing returns.[220]

165. In the context of the proposed transaction, residential broadband customers and edge providers represent "two sides" of the market, brought together through the provision of broadband services. Importantly, improvements in broadband services benefit both sides of the market and trigger the virtuous circle of innovations through network effects. Consider a network improvement by a broadband provider that increases the quality of an edge service (*e.g.*, faster broadband speed allowing for higher video streaming resolution). The increase in the quality of the edge service increases the value of broadband usage to end-users and increases demand for broadband services, which in turn increases the returns on investment and induces more innovations by all edge providers on this platform.

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219 Jeffrey A. Eisenach (2012), "Broadband Competition in the Internet," American Enterprise Institute, *available at* http://www.aei.org/files/2012/10/17/-broadband-competition-in-the-internet-ecosystem_164734199280.pdf, *site visited* March 28, 2014, 4.

220 *See Farrell and Klemperer (2007)*, 1974. ("From a cooperative game theory perspective, network effects are just economies of scale: the per-buyer surplus available to a coalition of buyers and a seller increases with the size of the coalition.")

166. Moreover, the virtuous circle of innovation, via two mechanisms, may induce a reaction from other broadband providers, including those that do not compete directly with the combined firm.

- First, improvements in Comcast's network will induce ISPs with which it competes to improve their own networks in competitive response. The history of broadband development in the United States is characterized by a long history of competitors developing new technologies that lead to higher broadband quality. For example, telcos have made investments in advanced DSL largely in response to the success of cable broadband.[221] Indeed, competitors have already indicated that the proposed transaction is causing them to accelerate their investments and fiber deployments. For example, as noted previously, Randall Stephenson, Chairman and CEO of AT&T, recently stated:[222]

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221 "AT&T Inc. at Goldman Sachs Communacopia Conference," Final Transcript, September 24, 2013. ("And it is going to be a dogfight between us and cable for the next 20 years; I don't see that changing. They will invest and they will step up. We will invest, it will go back and forth. But I feel really good that we will -- we're doing very well against cable today.")

Similarly, industry analysts agree that telcos are exerting competitive pressure on cable operators, including Comcast and TWC. (*See, e.g.*, Marguerite Reardon, "Why a Comcast Merger Could be Good for TWC Customers: How Can One of the Biggest Mergers in the Cable Market Ever be a Good Thing for Consumers? CNET's Marguerite Reardon explains," *CNET*, March 15, 2014. (". . . AT&T and Verizon Communications -- and to a much lesser extent, Google, are providing more incentive to all cable operators to increase their network speeds. Comcast actually faces less competition in its markets from Google and the phone companies than Time Warner Cable, and the increased exposure to this threat could spur faster improvement in the network. 'AT&T and Verizon are exerting tremendous pressure on the cable operators,' Brannon [Erik Brannon, senior analyst for US Television at HIS] said."))

222 "AT&T's CEO Presents at Morgan Stanley Technology, Media & Telecom Conference (Transcript)," March 6, 2014, *available at* http://seekingalpha.com/article/2072813-at-

> ". . . in light of a new competitor, a new structure in the industry . . . we are going to be a little more aggressive and assertive in deploying that technology around the country . . . It's our peak year on fiber deployment and our IP broadband extension, and we're committed to finishing that especially in light of as I said the competitive dynamic changing with Comcast and Time Warner. So we want to get that finished in 2014."

- Second, because edge providers generally provide services through multiple broadband providers, the improvements in edge services described in this section will in turn increase demand for broadband services not only from the combined firm but also from other ISPs. This increased demand for broadband services at other ISPs creates incentives for them to improve their broadband infrastructure and improve their broadband quality to meet this demand. *As a result, any innovation by edge providers induced by this transaction will ultimately increase both broadband quality and the quality of edge services available to customers of other broadband providers, not just customers of the combined firm.*

2. A merger with Comcast will lead to improved broadband quality in the TWC footprint

167. Post-transaction, TWC customers can expect to benefit by being part of Comcast's broadband network. Comcast's track record of high quality broadband service is clear: Comcast has invested tens of billions of dollars on upgrades to its network infrastructure since 1996. The result of Comcast's track record of broadband investment has been dramatic performance improvements in its network. As one example, Comcast has

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and-ts-ceo-presents-at-morgan-stanley-technology-media-and-telecom-conference-transcript, *site visited* March 28, 2014.

increased broadband speeds 12 times over the past 12 years.[223] Today, Comcast offers peak residential speeds of 105 Mbps in all markets and as high as 505 Mbps in some markets.[224]

168. Comcast's commitment to high-quality broadband performance is reflected in actual outcomes. For example, Table 2 shows that the percentage of Comcast customers with downstream speed tiers of at least 25 Mbps increased from [[ ]] percent in December 2011, to [[ ]] percent in December 2012, and to [[ ]] *percent* in December 2013. The corresponding percentages for TWC were just [[ ]] percent, [[ ]] percent, and [[ ]] percent.[225]

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223 *See* David L. Cohen, "Comcast and Time Warner Cable Announce Merger, Detail Public Interest Benefits and Undertakings," February 13, 2014, *available at* http://corporate.comcast.com/comcast-voices/comcast-and-time-warner-announce-merger-detail-public-interest-benefits-and-undertakings, *site visited* April 2, 2014.

224 *See generally*, http://www.comcast.com/505, *site visited* Apr. 3, 2014; http://www.comcast.com/internet-service.html, *site visited* Apr. 3, 2014.

225 The difference between the two firms is narrower for lower speeds. For example, [[ ]] percent of Comcast customers and [[ ]] percent of TWC customers have downstream speeds of at least 3 Mbps, based on December 2013 data.

Table 2: Share of Total Subscriptions with At Least 25 Mbps Downstream

	Comcast			TWC & Insight		
Month	Subscriptions with at least 200 kbps downstream	Subscriptions with at least 25 mbps downstream	Share	Subscriptions with at least 200 kbps downstream	Subscriptions with at least 25 mbps downstream	Share
Jun-11	[[					
Dec-11						
Jun-12						
Dec-12						
Jun-13						
Dec-13						]]

Sources: FCC Form 477 data.

169. Similar patterns are evident when one considers upstream speeds. For instance, Table 3 shows that the percentage of Comcast customers with upstream speed tiers of at least 3 Mbps increased from [[ ]] percent in December 2011, to [[ ]] percent in December 2012, and to [[ ]] percent in December 2013. The corresponding percentages for TWC were just [[ ]] percent, [[ ]] percent, and [[ ]] percent.

Table 3: Share of Total Subscriptions with At Least 3 Mbps Upstream

	Comcast			TWC & Insight		
Month	Subscriptions with at least 200 kbps downstream	Subscriptions with at least 3 mbps upstream	Share	Subscriptions with at least 200 kbps downstream	Subscriptions with at least 3 mbps upstream	Share
Jun-11	[[					
Dec-11						
Jun-12						
Dec-12						
Jun-13						
Dec-13						]]

Sources: FCC Form 477 data.

170. As I describe further in Section IV.B.3(a), Comcast has already committed to accelerate TWC's network upgrade plans, including converting the TWC network to an all-digital network and bringing the speeds TWC customers receive up to Comcast's standards. For example, as a result of the transaction, TWC customers currently on

TWC's flagship speed tier of 15 Mbps/1 Mbps would see their speeds increased to Comcast's flagship speed tier of 25 Mbps/5 Mbps.[226]

3. Specific examples of improvements in broadband quality in both Comcast's and TWC's footprints due to the proposed transaction

171. In this section, I describe several of the specific mechanisms through which the transaction will benefit residential broadband customers (and thus edge providers via the virtuous circle), including:

- Improvements in network standards and technology;
- Improved wired network infrastructure;
- Improved wireless access networks; and
- Improved home networks.

I discuss each one of these benefits, in turn, below.

(a) Improvements in network standards and technology

172. I understand that customers of the combined firm will benefit from Comcast's commitment, plans and incentives to (i) upgrade all TWC systems to digital technology more quickly; (ii) facilitate optimal use of DOCSIS 3.0 in the combined footprint by making available more QAM channels for Internet service and deploying CCAP-enabled Cable Modem Termination Systems (CMTS); and (iii) deploy DOCSIS 3.1 in the near

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226 Declaration of Michael J. Angelakis, ¶ 23.

future, each of which leads to improved broadband performance.[227] I further understand that, in combination, these technologies free up additional spectrum (by eliminating the need to use channels inefficiently to carry analog video), increase the spectral efficiency of the available spectrum, and bond more QAM channels, leading to substantially greater broadband speeds.

173. Starting in late 2008, Comcast undertook a network upgrade project to convert its network to all-digital.[228] By converting its network to all-digital, Comcast freed up approximately 250-300 Mhz of spectrum, which it then repurposed to provide faster broadband speeds.[229] In total, Comcast invested more than a billion dollars in making its entire network digital and deploying DOCSIS 3.0 by 2012.[230]

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227 *See* Declaration of Michael J. Angelakis, ¶ 24. *See also* "CMCSA - Comcast Corporation at Deutsche Bank Media, Internet and Telecom Conference," Edited Transcript, March 10, 2014, *available at* http://files.shareholder.com/downloads/CMCSA/0x0x732738/b11af39e-e366-4948-9ef9-3b05a9cbde09/Comcast%20at%20Deutsche%20Bank%20Conference%20Transcript.pdf, *site visited* March 28, 2014.

228 Internally, Comcast called this project "Project Cavalry." (*See* Comcast, "Going 'All-Digital' – Tons More HD and a Faster Internet," May 1, 2009, *available at* http://corporate.comcast.com/comcast-voices/going-all-digital_tons_more_hd_and_a_faster_internet, *site visited* March 28, 2014.)

229 "Comcast's Project Cavalry: The March of 28 Million DTAs," *Multichannel News*, May 5, 2009, *available at* http://www.multichannel.com/blogs/comcasts-project-cavalry-march-28-million-dtas, *site visited* March 28, 2014.

230 *See* || ||.

174. TWC took a different approach to freeing up bandwidth by adopting switched-digital video technology,[231] but it is now beginning to make the transition to an all-digital network to be able to deploy more advanced services. Currently, TWC's all-digital migration is complete in only about 17 percent of its footprint.[232] Even under its recently announced network investment plan, TWC expects to convert only 75 percent of its footprint to all-digital by the end of 2016 on a stand-alone basis.[233]

175. Post-transaction, Comcast will accelerate this transition to all-digital, thus freeing up more spectrum on the TWC network more quickly. Neil Smit, President and CEO of Comcast Cable, recently indicated that converting TWC's network to all-digital would be an initial focus of the post-transaction integration efforts, in order to, among other things,

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231 Channels delivered via switched digital video technology are only transmitted over the cable network on an as-needed basis, which is a more efficient use of network bandwidth than the traditional always-on delivery method (*see, e.g.*, http://support.brighthouse.com/Article/Switched-Digital-Video-SDV-7563/, *site visited* April 2, 2014.)

232 *See* Ian Olgeirson, "Charter, Time Warner Cable Lag in All-Digital Push To Convert CapEx into Capacity", SNL Kagan, January 17, 2014. ("Time Warner Cable is estimated to have made the [digital] transition in 17% of its homes passed, including markets in its New York cluster.") Delivering analog video takes up a significant portion of available cable spectrum relative to digital video. Consequently, transitioning to digital makes more 6 MHz QAM channels available for broadband.

233 TWC, "TWC Operational and Financial Plan," January 30, 2014, *available at* http://ir.timewarnercable.com/files/4Q13/TWC_Operational%20and_Financial%20Plan_vFINAL.pdf, *site visited* March 28, 2014, 11.

"free up bandwidth [,]… increase the speeds over DOCSIS 3.0, [and] rollout Wireless Gateway."[234]

176. Similarly, Comcast was one of the first cable operators to deploy DOCSIS 3.0, a standard for providing high-speed data service over a cable system. Comcast has invested more than $1 billion to migrate its network to all-digital and rollout DOCSIS 3.0 to more than 99 percent of its footprint and has deployed DOCSIS 3.0 capable modems to more than [[ ]] customers (approximately [[ ]] percent of its customer base).[235] In contrast, while TWC has also implemented DOCSIS 3.0 on more than 99 percent of its footprint, it has deployed DOCSIS 3.0-capable modems to only [[ ]] customers (approximately [[ ]] percent of its customer base).[236]

177. In conjunction with accelerating TWC's all-digital conversion, I understand that one of Comcast's initial post-transaction objectives is to increase broadband speeds by

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234 "CMCSA - Comcast Corporation at Deutsche Bank Media, Internet and Telecom Conference," Edited Transcript, March 10, 2014, *available at* http://files.shareholder.com/downloads/CMCSA/0x0x732738/b11af39e-e366-4948-9ef9-3b05a9cbde09/Comcast%20at%20Deutsche%20Bank%20Conference%20Transcript.pdf, *site visited* March 28, 2014.

235 John Schanz, Executive Vice President, National Engineering and Technical Operations, Comcast, February 28, 2014, interview.

236 Kevin Leddy, Executive Vice President, Corporate Strategy, TWC, February 28, 2014, interview.

utilizing DOCSIS 3.0 to its fullest by bonding together more QAM channels freed up by the accelerated transition to all-digital.[237]

178. Beyond DOCSIS 3.0, two new technological standards promise even faster broadband speeds and even greater benefits from the proposed transaction:

- CCAP is a technology that combines quadrature amplitude modulations (QAMs) technology (used in the distribution of digital video) with DOCSIS technology (used in the distribution of IP-based data) into a single CMTS that resides in the network infrastructure.[238] CCAP reduces the network's space and energy requirements and allows for more efficient management of digital and IP services.[239] CCAP also allows cable operators to use DOCSIS 3.0 to bond more QAM channels (up to the 32 downstream channels contemplated by DOCSIS 3.0) together to deliver faster downstream and upstream broadband speeds. Comcast expects to deploy CCAP to about [[ ]] percent of its footprint by year-end 2014

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237 "CMCSA - Comcast Corporation at Deutsche Bank Media, Internet and Telecom Conference," Edited Transcript, March 10, 2014, *available at* http://files.shareholder.com/downloads/CMCSA/0x0x732738/b11af39e-e366-4948-9ef9-3b05a9cbde09/Comcast%20at%20Deutsche%20Bank%20Conference%20Transcript.pdf, *site visited* March 28, 2014.

238 *See* CableLabs, "Operations Support System Interface Specification," August 8, 2013, *available at* http://www.cablelabs.com/wp-content/uploads/specdocs/CM-SP-CCAP-OSSI-I05-130808.pdf, *site visited* April 2, 2014.

239 CableLabs, Press Release, "CableLabs Intros CCAP Platform," June 14, 2011.

and to [[ ]] percent of its footprint by 2016.[240] In contrast, TWC only plans to deploy CCAP to 75 percent of its footprint over the next several years.[241]

- DOCSIS 3.1 is the successor standard to DOCSIS 3.0. By allowing for much greater spectral efficiency, it supports download speeds of up to 10 Gbps and upload speeds of up to 1 Gbps (relative to the DOCSIS 3.0 standard that supports download speeds of up to 1 Gbps and upload speeds of up to 240 Mbps).[242] Facilitated in part by its deployment of CCAP technology, Comcast expects to begin deploying DOCSIS 3.1 soon after the specifications are expected to be finalized in 2015, and it will be the first to do so among broadband providers.[243]

179. Comcast will be able to bring both of these enhancements—CCAP and DOCSIS 3.1—to TWC's network more quickly and more broadly than TWC could do alone. Among other things, these faster deployments will occur because, using its built-up experience, Comcast will be able to migrate TWC's systems to all-digital more rapidly

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240 John Schanz, Executive Vice President, National Engineering and Technical Operations, Comcast, February 28, 2014, interview.

241 TWC, "TWC Operational and Financial Plan," January 30, 2014, *available at* http://ir.timewarnercable.com/files/4Q13/TWC_Operational%20and_Financial%20Plan_vFINAL.pdf, *site visited* March 28, 2014

242 Intel, Press Release, "Intel Previews 1Gbps DOCSIS* 3.0 Gateway Capability at The Cable Show," May 21, 2012; CableLabs, Press Release, "New Generation of DOCSIS Technology," October 30, 2013, *available at* http://www.cablelabs.com/news/new-generation-of-docsis-technology/, *site visited* March 28, 2014.

243 John Schanz, Executive Vice President, National Engineering and Technical Operations, Comcast, February 28, 2014, interview.

than TWC could do on its own and will be able to accelerate the deployment of CCAP to TWC's *entire* footprint.[244]

(b) Improvements in wired network infrastructure

180. With respect to *wired networks*, customers of the combined firm will benefit from increased investment in access networks, as well as metro, regional, and national core networks. Such investments are motivated by a combination of increased opportunities to serve business accounts, cross-regional economies of scope in regional core networks, and economies of scale in investing in the national core network.

(1) Benefits to residential customers from build-out to serve more business customers

181. Recent history provides guidance on the beneficial effects of increased scale and scope: Comcast's recent expansion into the business services segment has provided benefits to all Comcast customers, including residential customers. In 2006, Comcast chose to invest in improving its regional core networks over building a parallel network to service the business segment because it decided that an integrated network would be more efficient.[245] Since 2006, Comcast has continued to make significant investments in its core networks to support business services. The benefits of these investments include

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244 John Schanz, Executive Vice President, National Engineering and Technical Operations, Comcast, February 28, 2014, interview.

245 This paragraph based on an interview with Kevin O'Toole, Senior Vice President, Product Development, Business Services, Comcast Corporation, March 26, 2014.

faster speeds and enhanced network reliability, among others. As explained in this section, all residential and business customers benefit from investment in the core networks, and this transaction will accelerate and enhance these investments.

182. The benefits to Comcast's residential customers from investments targeted toward business opportunities are heightened by the fact that many aspects of network infrastructure are common to both business and residential customers. For example, according to Comcast, approximately [[ ]] percent of business services revenue is derived from the Hybrid Fiber/Coax ("HFC") network, which is shared with residential customers.[246] Similarly, approximately [[ ]] percent of TWC's business services networks revenue is derived from services delivered over the HFC plant (which is shared with residential customers).[247] Furthermore, much of Comcast's network architecture is shared between business and residential customers. Common core architecture includes routers at the metro, regional, and national level, as well as the CMTS, and all the fiber links in between.[248]

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246 Kevin O'Toole, Senior Vice President, Product Development, Business Services, Comcast Corporation, March 26, 2014, interview.

247 Greg King, Senior Vice President, TWC Commercial Services, March 7, 2014, interview.

248 I understand that the only elements of the network architecture that are dedicated exclusively to businesses are those elements beyond the local routers associated with providing cell towers backhaul and Metro Ethernet (Metro Ethernet is a service designed to provide high-bandwidth connectivity to a business customer). [[ ]]